CAMERA LENS MODULE AND PORTABLE WIRELESS TERMINAL HAVING THE SAME

PRIORITY

This application claims priority to an application entitled "Camera Lens Module and Portable Wireless Terminal Having the Same" filed with the Korean Industrial Property Office on July 10, 2002 and assigned Serial No. 2002-39960, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a portable wireless terminal, and more particularly to a camera lens module mounted on a portable wireless terminal and a portable wireless terminal having the same.

2. Description of the Related Art

Due to the development of the information and communication technology industry, various types of portable wireless terminals having various functions are coming into the market. Such terminals typically include a common bar type terminal, a flip type terminal provided with a flip cover, a folder type terminal with a folder which is mounted to be capable of being closed and opened to a predetermined angle on the main body of the terminal, and so forth.

Said terminals are additionally provided with various functions, for example, e-mail reception and transmission, Internet games, character transmission, and so forth, beyond the basic functions for sound transmission and reception. Recently, as

novel modes of communication technology such as CDMA 1x EVDO have been introduced, the services available are increasingly extended to inter-user image communication between terminals, moving image service, etc.

As a result, the terminals are additionally provided with various key buttons, a camera lens, etc., in order to perform the above-described functions.

In particular, as the image communication and moving image service using portable wireless terminals have been extended, a camera lens gradually has become an essential component of a portable wireless terminal.

However, due to the tendency toward miniaturizing and lightening portable wireless terminals, it is difficult to secure a space for mounting a camera lens in wireless terminals. Furthermore, because the lens has been mounted on a side of a display or a top surface of the body, and has been directed toward a specific direction, there is inconvenience in that it is necessary to change the direction of the terminal in order to photograph objects positioned at various angles. Also, there exists a camera lens which can be removably attached to a portable wireless terminal using a ear-microphone jack or the like. However, such a camera lens is troublesome in that its user is required to separately carry and attach it to the terminal as needed.

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior art, and the object of the present invention is to provide a camera lens module for a portable wireless terminal which renders it easy to photograph from various angles while securing a space for

mounting a camera lens.

In order to accomplish the aforementioned object, in accordance with the present invention, there is provided a camera lens module for a portable wireless terminal which comprises a camera unit consisting of a camera lens and a flexible printed circuit which provides an electrical connection means for the camera lens; a front cover comprising one or more ribs which form a lens receiving recess within which the camera lens is received, and an opening portion for exposure of the camera lens; a housing, one end of which is connected with the front cover to protect the camera lens received within the front cover and which is provided with a partition in a predetermined internal position, wherein the partition exposes the lens receiving recess of the front cover and a through-hole is formed in the partition to provide a passage for allowing the flexible printed circuit of the camera unit to be passed; a rear cover comprising a first flange which is connected to the other side of the housing and closes the through-hole of the housing, and a male hinge member which extends from the first flange and provides a connecting means to be rotatably connected to the portable wireless terminal, wherein a slit is formed in the longitudinal direction of the male hinge member from the first flange, so that the slit provides a passage for allowing the flexible printed circuit to be laterally extended; a female hinge member comprising a cylinder which receives the male hinge member of the rear cover in such a manner a tip end of the male hinge member can protrude out of the cylinder, and a second flange which is diametrically extended from one side of the cylinder and connected to the first flange of the rear cover, wherein a slit which corresponds to the slit of the rear cover is formed in the female hinge member to be extended in the longitudinal direction of the female hinge member from the second flange; and an elastic means which is mounted between the first flange and the second flange for providing elastic force for the female hinge member in the

longitudinal direction of the female hinge member.

In addition, the present invention provides a portable wireless terminal comprising a main body and a folder rotatably hinged to the main body, wherein the portable wireless terminal further comprises a camera lens module which is rotatably connected to a module receiving portion formed in a side of a top end of the main body, the camera lens module comprising: a lens assembly comprising, in combination, a front cover within which a camera lens is received, and a cylindrical housing, one end of which is connected to the front cover to protect the camera lens received within the front cover and through which a flexible printed circuit of the said camera lens is drawn out; a rear cover comprising a first flange connected to the other end of the housing, and a male hinge member which extends from the first flange and provides a connecting means for allowing the camera module to be rotatably connected to the module receiving portion in the main body; a female hinge member comprising a cylinder which receives the male hinge member of the rear cover in such a manner that the tip end of the male hinge member can protrude out of the cylinder, and a second flange which is diametrically extended from one side of the cylinder and connected to the first flange of the rear cover; and a hinge assembly combined with an elastic means which is mounted between the first flange and the second flange for providing elastic force for the female hinge member in the longitudinal direction of the female hinge member.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view showing a portable wireless terminal provided

with a camera lens module in accordance with the present invention;

FIG. 2 is an exploded perspective view showing a camera lens module of a portable wireless terminal in accordance with a first preferred embodiment of the present invention;

FIG. 3 is a perspective view showing the camera lens module shown in FIG. 2, which is connected to a portable wireless terminal;

FIG. 4 is a perspective view showing a front cover of the camera lens module shown in FIG. 2;

FIG. 5 is a perspective view showing the front cover and a housing of the camera lens module shown in FIG. 2 in the assembled state;

FIG. 6 is a perspective view showing a camera unit of the camera lens module shown in FIG.2;

FIG. 7 is a perspective view showing a rear cover of the camera lens module shown in FIG. 2;

FIG. 8 is a perspective view showing a female hinge member of the camera lens module shown in FIG.2;

FIG. 9 is a perspective view showing the camera lens module shown in FIG. 2;

FIG. 10 is an exploded perspective view showing a camera lens module of a portable wireless terminal in accordance with a second preferred embodiment of the present invention;

FIG. 11 is a perspective view showing a rotating frictional piece, which is fitted onto the female hinge member of the camera lens module shown in FIG. 10;

FIG. 12 is a side view showing a module receiving portion of the portable wireless terminal; and

FIG. 13 is an exploded perspective view showing a camera lens module of a portable wireless terminal in accordance with a third preferred embodiment of the

present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. In the following description of the present invention, a detailed description of known functions and configurations incorporated herein is omitted to avoid making the subject matter of the present invention unclear.

FIG. 1 is a perspective view showing a portable wireless terminal provided with a camera lens module 100. As shown in FIG. 1, the camera lens module 100 may be mounted on the hinged part of a folder type terminal. The folder type terminal comprises a main body 10, which is provided with a plurality of keys forming a key pad 11, a transmitting part and etc., and a folder 20 which is rotatably connected to the main body 10 and provided with a display 21.

FIG. 2 is an exploded perspective view showing the camera lens module 100 of a portable wireless terminal in accordance with the first preferred embodiment of the present invention, and FIG. 3 is a perspective view showing the camera lens module 100 which is connected to the portable wireless terminal. As shown in FIGs. 2 and 3, the camera lens module 100 of the portable wireless terminal in accordance with the first preferred embodiment of the present invention comprises a camera lens 131, which is received within a housing 120 and front and rear covers 110, 140 and which are rotatably connected to a module receiving portion 300 in the main body of the terminal via the rear cover 140 and a female hinge member 160.

The module receiving portion 300 may be divided into a lens receiving

portion 301 and a hinge receiving portion 302. The lens receiving portion 301 is formed at a side of a top end of the main body in a curved shape, and a lens assembly 101 of the camera lens module 100 is positioned in the lens receiving portion 301. The hinge receiving portion 302 is formed in a cylindrical shape which has an opened end in a side adjacent to the lens receiving portion 301 and a closed end 304 on the other side. For purposes of appearance, it is preferable to align the external circumferential surfaces of the lens assembly 101 and the hinge receiving portion 302 with each other when the camera lens module 100 has been assembled. Meanwhile, a through-hole 306 (as shown in FIG. 12) is formed in the closed end 304 of the hinge receiving portion 302, through which a tip end of a hinge assembly 103 protrudes, so that the through-hole 306 provides a connecting means for said camera lens module 100.

Referring to FIGs. 2 and 4, ribs 111 are extended from a side of a front cover 110, thereby forming a recess for receiving the camera lens 131. The ribs 111, which form a lens containing recess 115, are bent to such an extent that they can position the camera lens 131 while supporting bottom and opposite lateral sides of the camera lens 131, and thus the ribs 111 restrain the top side of the camera lens 131. In addition, the front cover 110 has an exposure opening portion 113a. The exposure opening portion 113a consists of a lens cover 113b which extends from the external circumferential surface of the front cover 110 parallel to the ribs, and an opening 117 formed in the lens cover 113b. The camera lens 131 is exposed through the opening 117. The opening 117 is covered by a transparent window 119 so as to shut off interconnection between internal and external sides, so that the camera lens 131 can be protected. Meanwhile, the ribs 111 are provided with one or more screw holes 112. Preferably, the number of the screw holes is determined in consideration of connecting force and manner of assembling the camera lens module. The present

embodiment is provided with two screw holes.

The housing 120 is open at its opposite ends and its internal space is divided into two parts by a partition 121 (see FIG. 5). The front cover 110 is connected to one end of the housing, so that the ribs 111 of the front cover 110 will abut against the partition 121 of the housing 120. The partition 121 of the housing 120 is provided with a through-hole 123 for exposing the lens containing recess 115 of the front cover 110.

The camera lens 131 is fitted into the lens containing recess 115 through the through-hole 123 and is protected by the housing 120, and a flexible printed circuit 133, which provides an electric connection means of the camera lens 131, is drawn out through the through-hole 123. In addition, the housing 120 is formed with a recess 128 on its circumference surface (see FIG. 2), which corresponds to the exposure opening portion 113a in shape, thereby providing a space for receiving the exposure opening portion 113a and a supporting die 126 (not shown) for supporting the window 119 which is installed in the opening 117. Furthermore, a projection 114 is formed at the end of the exposure opening portion 113a and a hole 125, which corresponds to the projection 114, is formed in the recess 128, thus providing a stable connection between the front cover 110 and the housing 120. Meanwhile, the partition 121 of the housing is formed with connecting holes 124 which correspond to the screw holes 112.

The partition 121 of the housing 120 is positioned within the housing 120 inwardly spaced from the other end of the housing 120, thus providing a space for connecting the rear cover 140.

FIG. 5 is a perspective view showing the front cover 110 and the housing 120 in the assembled state. As shown in FIG. 5, if the front cover 110 and the housing 120 are assembled with each other, the exposure opening portion 113a of the front cover 110 is fitted into the recess 128 formed on the external circumferential surface of the housing 120 and the lens containing recess 115 is exposed through the through-hole 123 formed in the partition 121 inside of the housing 120. Therefore, the camera lens 131 can be fitted into the lens containing recess 115 of the front cover 110 through the through-hole 123 as explained above.

FIG. 6 is a perspective view showing a camera unit 130 of the camera lens module 100 shown in FIG. 2. As shown in FIG. 2, the camera unit 130 comprises the camera lens 131 and the flexible printed circuit 133, one end of which is connected to the camera lens 131. The flexible printed circuit 133 is laterally drawn from the camera lens 131, turned to a 90° direction and then connected to a main board (not shown) in the main body.

FIG. 7 is a perspective view showing the rear cover 140 of the camera lens module 100 shown in FIG. 2. As shown in FIGs. 2 and 7, the rear cover 140 comprises a first flange 141 and a male hinge member 145. The first flange 141 has through-hole(s) 147 which correspond to the screw hole(s) 112 in the front cover 110 and the connecting hole(s) 124 in the housing 120. Therefore, the front cover 110, the housing 120 and the rear cover 140 are connected with each other by linearly arranging the screw hole(s) 112, the connecting hole(s) 124 and the through-hole 147 and then fitting one or more screws into them.

From one side of the first flange 141, a fixed supporting die 148 protrudes to fix the camera lens 131 positioned within the lens containing recess 115 of the front

cover 110. The fixed supporting die 148 supports one side 135 of the camera lens 131 which is positioned within the lens containing recess 115 (see FIG. 5), thus preventing the camera lens 131 from being moved.

The male hinge member 145 is extended from the other side of the first flange 141. A connecting groove 146 is formed in the circumferential direction on a portion of an outer surface near the tip end of the male hinge member 145, which is located away from the first flange 141. As shown in FIG. 3, the tip end of the male hinge member 145 protrudes through the through-hole 306 formed in the closed end 304 of the module receiving portion 300 and an E-ring 173 is fitted into the connecting groove 146 on the protruding end. As a result, the camera lens module 100 is connected to the module receiving portion 300 and the male hinge member 145 provides a rotational axis for the camera lens module 100. In addition, a projection 144 is formed on the circumferential surface of the tip end of the male hinge member 145 and a stopper 308 (not shown in FIG. 3) is provided in the inside of the through-hole 306 of the module receiving portion 300, thereby limiting the rotating range of the male hinge member 145.

It is possible to construct the male hinge member to be rotatable through a full 360° without any limit. However, it is preferable to limit the rotating range of the male hinge member 145 in order to avoid damage in the final product, because the length of the internal flexible printed circuit 133 is limited. This will be described further in detail with reference to the second preferred embodiment of the present invention.

Meanwhile, a slit 143 is longitudinally formed on the male hinge member 145 of the rear cover 140 from the first flange 141. The slit 143 provides a passage

for laterally drawing out the flexible printed circuit 133 of the camera unit 130 assembled to the lens assembly 101. Flat surfaces 149 are formed between the tip end of the male hinge member 145 and the first flange 141. This is to prevent a female hinge member 160, to be explained below, from being moved after assembly.

FIG. 8 is a perspective view showing the female hinge member 160 of the camera lens module 100 shown in FIG. 2. As shown in FIG. 8, the female hinge member 160 consists of a second flange 163 and a cylinder 161. The second flange 163 is formed to correspond to the first flange 141 of the first cover 140, wherein the first flange 141 is provided with a projection 142 and the second flange 163 is formed with a groove 162 which is mated with the projection 142. The projection 142 and the groove 162 establish the connecting angle of the female hinge member 160 while restraining relative rotation between the rear cover 140 and the female hinge member 160. The inner side 167 of the cylinder 161 takes a form which is complementary to the male hinge member 145 of the rear cover 161, thus further reinforcing rotational restraint force. Therefore, the rear cover 140 and the female hinge member 160 can be rotated in unison. In addition, the female hinge member 160 is formed with a slit 165 which corresponds to the slit 143 of the rear cover 140, and the slit 165 provides a passage for drawing out the flexible printed circuit 133 of the camera unit 130.

The female hinge member 160 may be formed from plastic in order to reduce frictional force.

Furthermore, an elastic means 150 is provided between the first flange 141 and the second flange 163 (see FIG. 2). The illustrated elastic means 150 is a leaf spring in the form of crimped washer, which is cut in a shape corresponding to that

of the slits 143 and 165, which are formed in the rear cover 140 and the female hinge member 160, respectively. Alternatively, the elastic means 150 may be formed by adhering a rubber washer 250 on the first flange 141 of the rear cover 140 (not shown).

The elastic means 150 will provide elastic force for the female hinge member 160 in the longitudinal direction of the female hinge member 160. This allows the camera lens module 100 to stably rotate without shaking because the elastic force causes a tip end of the female hinge member 160 to be in close contact with an internal wall of the closed end 304 of the module receiving portion 300 of the main body once the camera lens module 100 is assembled to the module receiving portion 300. That is, the camera lens module 100 can be prevented from experiencing undesired rotation due to its own shaking or the self-tension of the flexible printed circuit 133.

FIG. 9 is a perspective view showing the camera lens module 100 shown in FIG. 2. As shown in FIG. 9, the tip end of the male hinge member 145 protrudes out of the cylinder 161 of the female hinge member 160. That is, the projection 144 and the connecting groove 146 of the male hinge member 145 is exposed outward from the cylinder 161 of the female hinge member 160. As previously described, the projection 144 rotates within the through-hole 306 of the module receiving portion 300 and its rotating range is limited by the stopper 308 provided in the through-hole. The connecting groove 146 is exposed outward from the module receiving portion 300, so that the E-ring 173 can be fitted into the connecting groove 146.

Meanwhile, the flexible printed circuit 133 laterally extended from the cylinder 161 will be wound 720°, i.e. two turns around the cylinder 161, in

consideration of the rotation of the camera lens module 100. This allows for reliable connection between the flexible printed circuit 133 and the main board (not shown) while providing a length of the flexible printed circuit 133 for the rotation of the camera lens module 100.

FIG. 10 is an exploded perspective view showing the camera lens module 200 for a portable wireless terminal in accordance with the second preferred embodiment of the present invention, and FIG. 11 is a perspective view showing the female hinge member 260 and a rotating frictional piece 270 of the camera lens module 200 shown in FIG. 10, in the assembled state. This embodiment is identical to the first embodiment, except that the rotating frictional piece 270 is additionally provided. Therefore, like components are indicated by like reference numerals.

The rotating frictional piece 270 is a component for allowing the user to feel the rotation of the camera lens module 200 by tactile sense. The rotating frictional piece 270 is formed in a shape of plate, in which a frictional projection 271 is formed on a diametrically extended rib; the rotating frictional piece 270 is fitted onto the tip end of the female hinge member 260. Because the tip end of the male hinge member 145 protrudes through the tip end of the female hinge member 260 (as shown in FIG. 10), the rotating frictional piece 270 is also provided with a hole for allowing the male hinge member 145 to protrude through the hole. In addition, for connection between the female hinge member 260 and the rotating frictional piece 270, the tip end of the female hinge member 260 is provided with at least two connecting projections 261 and the rotating frictional piece 270 is provided with connecting grooves 273 around the hole formed in the rotating frictional piece 270; the connecting grooves are spaced to correspond to the connecting projections 261 of the female hinge member 260.

Furthermore, as shown in FIG. 12, the through-hole 306 formed in the closed end 304 of the module receiving portion 300 is provided with stopper 308 which limits the rotational range of the projection 144 formed in the tip end of the male hinge member 145. The stopper 308 is constructed to allow the male hinge member to rotate in the range of approximately 260° to 270°. That is, the camera lens module 200 is constructed to be rotatable beyond 180°. Therefore, the user can perform image communication using the camera lens module 200. It is also possible to visually confirm the view through the display 21 of the terminal when photographing an object. These effects can also be applied to the first preferred embodiment of the present invention, as previously described.

Furthermore, the internal wall of the closed end 304 is provided with a plurality of grooves 309 along a rotational track of the frictional projection 271, so that they are to be engaged with the frictional projection 270. As a result, when the camera lens module 200 rotates, vibration produced by the frictional projection 271 and the grooves 309 is transferred to the tactile sense of the user.

FIG. 13 is an exploded perspective view showing camera lens module 400 for a portable wireless terminal in accordance with a third preferred embodiment of the present invention having an opening portion 421 formed on housing 420 for exposure of the camera lens 130. This third embodiment is similar to the second embodiment, with like components indicated with like reference numerals.

As described in the above, the camera modules in accordance with the various embodiments of the present invention are readily mounted on the hinged part of a portable wireless terminal. And if they are applied in the hinged part

between the main body and the folder of a folder type terminal, it is easy to rotate the camera lens module, and thus enhance the convenience of using the terminal.

According to the camera lens module in accordance with the present invention, it becomes possible to take photographs from various angles without largely varying the position or angle of the terminal, because the camera lens module is constructed to be rotatable in relation to the terminal without any inconvenience, without the user being required to additionally separate or connect the camera lens module. In addition, it becomes easy to secure a space for mounting the camera lens module, because the camera module is mounted using the hinged part of the terminal.

One of skill in the art will be recognize that the disclosed invention is not limited to use with bar, folder or flip type terminals, and that the disclosed invention is also applicable to the other terminals capable of inter-user image communication between terminals, including PDAs and notebook computers.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.